VI. MONITORING

Monitoring is critical to evaluating our success in achieving late-successional structural characteristics across the landscape. Several large scale ecological questions surfaced in this assessment. These questions generally revolve around management activities to improve older forest patch function by increasing the area of interior forest, t e connectivity between patches, and/or controlling human access. These questions are not new and have been extensively discussed in the literature and locally in the following documents: FEMAT (1993), First Approximation of Ecosystem Health (1993), in the Assessment Report. (1995), and a biodiversity conservation plan by Noss (1992). T e following provides some background on the significance of these questions to this assessment.

Interior Habitat

It is assumed that the bigger the patch of older interior forest, the better it will function as habitat for old-growth dependent species. Interior forest conditions occur when microclimate conditions are stabilized -- beyond the influence of edge-effects. In this province, microclimate edge effects are stabilized within 3 tree lengths (Concannon 1996, Chen 1991). Patch size based on this definition provides an absolute minimum based only on microclimate. Other approaches to defining patch size have ranged from individual (OWL) or species groups (HABSCAPES) to historical landscape vegetation pattern analysis. Species approaches typically build on known home range sizes and progressively increases the patch size as a function of number of species. The historical landscape pattern approach assumes that patterns of the past to which the biota have adopted will be suitable for conserving these species into the future. Hence, knowing the range of historical landscape patterns will help us manage for the appropriate mix of patches in the landscape. Both approaches were considered in the establishment of these LSRs in the Northwest Forest Plan.

Interior forest habitat conditions and area may be increased by altering the structure of plantations next to or within existing older forest patches. Accelerating the development of these plantations to more nearly approximate the characteristics of the surrounding forest should stabilize microclimate changes at the perimeter and interior of older stands. These changes in humidity, temperature, light, and wind have important implications to growth rates, species composition, and organic matter decomposition rates (Concannon 1996, Chen 1991).

We would expect interior forest microclimate to develop and function differently depending on the silvicultural prescriptions. If plantations are "left alone", dense stands would develop which would reduce air flow, increase humidity, and reduce light in the surrounding natural stands. In some cases, this may be a desirable response. Eventually, these dense stands would self-thin and microclimate conditions would be expected to stabilize. This would likely take much longer than if the plantations were thinned because of the age-size gap between the natural stands and plantations.

If plantations are managed to "look" or function more like the surrounding natural stands, then microclimate variability would be expected to be similar to the surrounding stands over time. Following thinning, an abrupt change in micro-climate should occur depending on the density of

remaining trees. Initially air flow, temperature and light would be expected to increase and humidity to decrease. This effect could be moderated by light thins with multiple entries.

Alternatively, plantations could be managed to maximize old growth characteristics. In a landscape dominated by 100 to 150-year old homogeneous Douglas-fir stands, thinning plantations would create islands of diversity with very different structure than the surrounding natural stands. Through underplanting and multiple entry thinnings, this approach would moderate wind flows, and increase shading and humidity over time. However, if a heavy thinning is applied, considerable drying would be expected until the underplanted trees were we l established.

At the stand scale, many alternative approaches are being tried and evaluated (Cataract-Wildcat-Yachats, Big Elk, Grant/Feagles, and Callahan Cr. Density Treatments, Black Rock, Hebo Restoration). These stand level treatments will help us better understand the responses of vegetation and some small home range animals to various silviculture density and coarse woody debris treatments. Whether these stand level treatments will produce the desired habitat response for animals preferring large areas of interior older forest conditions is questionable.

Since the ecosystem response, especially the cumulative landscape effects, to these three approaches (leave alone, look alike, or max old-growth) is unknown, it seems that the most prudent and effective approach would be to try all of them in a systematic way. In essence, use an adaptive management approach as described by Bormann et al. 1995. This will yield a variety of stands and landscape conditions which could then be compared, monitored, and evaluated by future managers, scientists, and citizens. Using an adaptive management approach to develop a landscape design directed towards monitoring will provide future managers with better information and more choices about what should or shouldn't be done to manage for older forest habitat.

Appendix G provides an example of how adaptive management could be used to increase the effectiveness of a monitoring program. This example is hypothetical and needs to be further refined and developed before it could be implemented. Development of a proposal would be in coordination with all BLM and National Forest management areas involved in the design.

Human Access

The Coast Range has been extensively roaded. Prior to 1945, the average size of security areas (areas greater than 1/4 mile from a road) was 3,000 acres. By 1990, it was reduced to 137 acres. This reduction corresponds to the loss of wolves, fisher, and wolverine (Siuslaw 1995). Indirect human disturbance and roads may have effects on use of older forest habitat for many other species. Considering the human population growth projections in the valley and coastal strip and the greater interest in outdoor experiences, these potential effects may become more significant over the next 20-30 years than possible positive effects from silviculture treatments.

The Access and Travel Management Plan for the Siuslaw N.F. identifies 700 miles of roads maintained for public travel. The existing road system is 2200 miles. To date, approximately 800 miles of road have been hydrologically stabilized. This reduction in miles of maintained roads has

been driven by declining road budgets. To evaluate the influence of roads and human disturbance on the functioning of older forest habitat, access and travel management plans should be addressed in a landscape design.

Connectivity

"Connectivity is a measure of the extent to which the landscape pattern of the late-successional/old growth ecosystem provides for biological and ecological flows that sustain late-successional/old growth animal and plant species" (FEMAT, IV-52). The term "connectivity" may have different connotations, depending on the species, ecological process, or scale being considered. Con ectivity for large home range species such as spotted owls will require a province-wide perspective while stands or groups of stands may be a sufficient perspective for a mollusk species.

The Forest Ecosystem Management Assessment Team (FEMAT) developed a strategy of a network of reserve areas with an intervening matrix to meet the needs of late-successional forest species. This strategy was adopted in the Northwest Forest Plan. Connectivity, as addressed in the strategy, can be broken into 3 major categories:

1) The LSRs are intended to be large, contiguous blocks of habitat that can sustain populations or sub-populations of most late-successional associated species. The LSRs are spaced close enough together to allow for mobile species to disperse between LSRs and interact with at least an occasional genetic interchange. The intervening matrix does not need to be late-successional habitat but must provide needs for dispersing individuals.

2) Riparian Reserves (RRs) provide connectivity in the way of contiguous habitat for less mobile species unlikely to survive outside late-successional forests even during dispersal. "Riparian Reserves are used to ... improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors among the Late-Successional Reserves." (ROD, B-13)

3) The matrix is designed to maintain small blocks of late-successional habitat to provide both "stepping stones" for species to move between LSRs and refugia for immobile species. "Isolated remnant old-growth patches are ecologically significant in functioning as refugia for a host of old-growth associated species, particularly those with limited dispersal capabilities that are not able to migrate across large landscapes of younger stands." (ROD, C-44)

Landscape scale connectivity corridors were identified in this assessment (**Map 12**). Monitoring the effectiveness of these corridors will need to be done at the province scale if not larger.

Snags and CWD

Assessing levels of CWD on the landscape is proposed as an essential component of the CWD assessment process. The field techniques to ascertain CWD levels have not been developed and agreed upon at this time. An essential monitoring component is to assure that these techniques are:

developed; appropriate for IDT use; reliable qualitative estimate of existing CWD levels. Implementation monitoring will ascertain if a variety of CWD levels are being left on the landscape. Effectiveness monitoring should determine the value of providing new, small diameter CWD and/or no additional CWD during the initial commercial entry into young plantations for resources which might benefit from that addition.

Risk Assessment

One critical phase of monitoring is testing assumptions and revising management actions when those assumptions are inappropriate. In this assessment, several hypothesis have been put forward to assist in the understanding of landscape function. The following is an assessment of the benefits and risk associated with following those hypotheses with management activities.

Landscape Analysis

LSR Zones provide a co rse assessment of the functions and roles of different re s of the l ndscape. Landscape Cells help to set priorities for treatment opportunities. These designations do not restrict management only to these areas. Prioritization of treatment areas does not res rict the management of plantations in lower priority landscape cells. There will be ecological or biological reasons to manage areas across the landscape; i.e., treatment windows, T&E habitat restoration. The prioritization scheme was developed to suggest to managers that with limited funding and people to implement activities that the most benefit, based on restoration of the best habitat first, would be gained by implementing treatments in certain areas before others.

Priorities were established based on the same approach that was taken for aquatic restoration. It ties to the refugia concept. Large blocks that are relatively intact and support intact populations of organisms, are more important to restore than more degraded habitats. Our goal is to create and maintain the most late-successional habitat within the least amount of time. With reduced budgets, it's important to focus efforts in areas where we can be most successful. Another option is to work with the most degraded habitat. In these areas, there are isolated, scattered blocks of mature forest and limited places to link those blocks; one would have to grow the vegetation more or less simultaneously. This approach would take much longer to achieve the desired goal and more funding would be necessary to treat larger areas of the landscape. However, management of these areas is important to help recover areas that once had habitat. If the priorities are wrong, there is a low risk to meeting LSR objectives. Project implementation will only be accomplished on relatively small acreages within the LSRs; it will take decades to implement activities. There will be enough flexibility to redirect our emphasis.

The team understands that some funding allocations are limited to work in matrix land use allocations. This assessment in no way attempts to guide type or spatial allocation of management on matrix lands.

Successional Pathways

The successional pathway models are a first attempt to understand how vegetation changes on the landscape based on site condition and disturbance processes. There are scientific articles which discuss successional models but we found none that try to understand succession by sub-series environment. It is expected that further refinement of these successional pathways will occur as more people begin to evaluate these concepts. Historic photography of the area suggests that these differences in vegetative conditions on the landscape do occur and are predictable. The drawbacks of following these pathways are, for example, that wider spacing in the wet environments cuts down on future options for conifer or you may loose the existing conifer due to erratic blowdown. Its strength is in the variability of prescriptions that can be expected across the landscape. Another alternative is to devise a limited number (1 or 2) of prescriptions that will be employed across the whole area. If in the wet environment, 80-100 conifers per acre is the prescription, for example, managers would have to spend extra money trying to reduce vegetative competition with the conifers in an area where wider spacing of conifers would have occurred naturally. ROD B-6 directs that silvicultural prescriptions be varied across the landscape. These successional pathways provide some guidance for achieving that diversity. Whatever prescription is employed, it is important to leave all the pieces that are necessary to maintain the health of the ecosystem.

Disturbance Regimes

There is a low risk of not attaining LSR objectives if the delineation of disturbance regime blocks is not accurate. These are an initial attempt to understand the processes operating in the landscape. Disturbance regimes were only one of the factors that went into landscape analysis. Types of appropriate management prescriptions that will be employed do not follow regime blocks at the stand level. On the landscape level, treatments will be spread out spatially and temporally. Implementation of activities will take decades, and the focus can always be changed if new information becomes available.

LSR Landscape Monitoring Goal

The long-term goal is to provide future managers, scientists, and citizens with better information and the opportunity to evaluate the effectiveness of different management approaches to achieving LSR objectives.

Many of the important issues about how to manage for older forest conditions will take at least 20-40 years to begin to address. This response time, which is relatively short, is due to the productivity of the Coast Range. While this response time is short, it is much too long for human careers. Consequently, we must setup and implement our management activities so future natural resource managers can evaluate the effectiveness of the treatments we prescribe.

Currently we approach activities on a "project by project" basis with emphasis being given to stand or reach level monitoring. Cumulatively, this approach may not "add-up" to the desired landscape level objectives for older forest ecosystems. Without a landscape monitoring strategy, this "project by project" approach may not provide adequate comparisons for future generations.

Monitoring Components

The ROD 1994 has outlined the minimum implementation monitoring components that need to be addressed in LSRs. Bureau of Land Management Resource Management Plans and the Siuslaw National Forest Plan all have incorporated sections on implementation monitoring. Those monitoring plans will be tiered to for LSR concerns.

Currently there are several ongoing efforts to evaluate effectiveness monitoring strategies. The REO and several subgroup task forces are addressing specific components that should be included in an overall strategy. The Eugene and Salem Districts of the BLM, the Siuslaw N.F., and the Pacific Northwest Research Station are initiating an effort to devise a pilot Province Monitoring Plan that will be implemented throughout the Region. Those strategies will address LSR components that must be monitored. Locally, we will tier to those higher level plans.

This LSRA highlights the following specific monitoring components that need to be addressed:

- An interagency evaluation of landscape structural changes over time. This would include an assessment of mature patch sizes, the number of mature patches and the acreage of mature forest.

- Specific T&E species habitat trends need to be evaluated. This would look at the changes in the conditions of, for example, known northern spotted owl activity centers over time.